



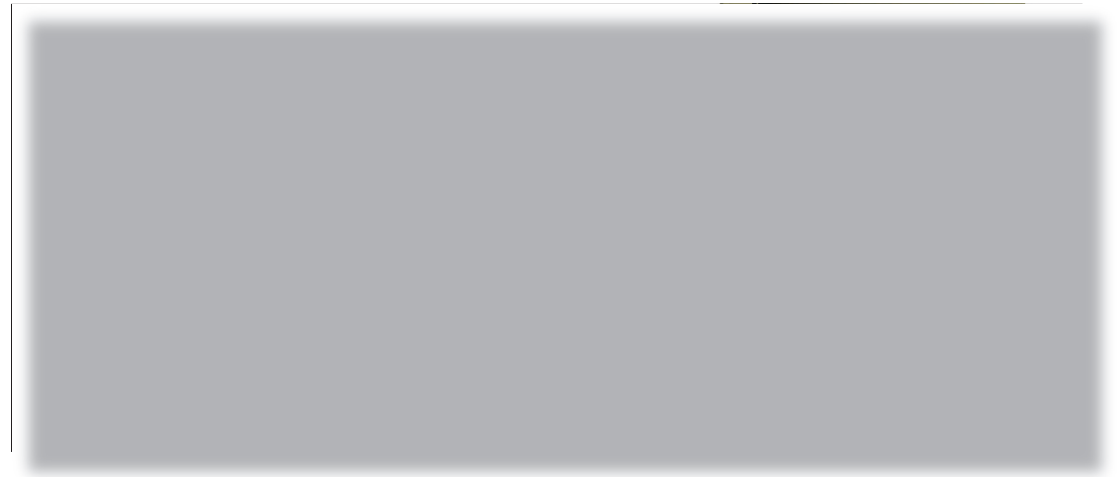
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force



Success Story

SHOCK RING TECHNOLOGY IMPACTS FUTURE SPACECRAFT PROGRAMS



Shock ring technology will increase the number of low-cost payload launch opportunities, which will have a tremendous impact on future spacecraft programs. This increase is anticipated due to a reduction in expensive payload design and redesign costs. Additionally, integration with a low-shock separation system will further reduce integration and testing requirements.



Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

The AFRL Space Vehicles Directorate, along with the Space and Missile Systems Center's Detachment 12 and CSA Engineering, Inc., developed a shock ring system under a Small Business Innovation Research Phase II contract aimed at creating a whole-spacecraft passive shock isolation system for a variety of launch vehicles. The shock ring first flew on the Vibro-Acoustic Launch Protection Experiment-1 (VALPE-1) aboard a Terrier-Orion sounding rocket and served as the passive stage for an active-passive hybrid system aboard VALPE-2.

The shock ring system can attenuate the harsh shock environment for a multitude of launch vehicles, including the evolved expendable launch vehicle (EELV), in combination with the EELV secondary payload adapter and Missile Defense Agency (MDA) target launch vehicles. This technology has generated interest from the Air Force, Department of Defense, commercial companies, and universities to enable the flight of many delicate payloads.

Currently, to compensate for harsh launch environments, payloads must be designed and tested to very high shock and vibration levels, greatly increasing the mass and cost of many payload components. The shock ring reduces these high costs by allowing more satellites to be launched or more capability with a given payload weight. The advantage of a shock ring system over previously flown isolation systems is that the shock ring is not a point design for a given launch vehicle payload combination. It is a one-or-two-sizes-fit-all approach.

Background

Shock ring systems are mounted between the primary spacecraft separation system and the launch vehicle. For MDA target launch vehicles, the ring can be attached as a wafer between a motor, such as the M57, and an upper stage, where it attenuates high-frequency loads while replicating the existing bolt interface for the existing attachment points. For other launch vehicles, the shock ring attaches between the separation system and the launch vehicle. To provide minimal impact to the launch vehicle, the shock ring duplicates the standard bolt pattern of the vehicle and separation system and can be inserted with only 2 or 3 in. of additional height.

The first operational flight will be on the Multiple Space Vehicle-05 mission, launched on an Atlas V carrying FalconSat-3, a US Air Force Academy satellite. The flight will demonstrate the effectiveness of the shock ring system for a host of large launch vehicle applications.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (04-VS-02)